# DRAFT

# DPD

# Director's Rule 14-2006

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Introduction

Currently, there are no documented procedures for the proper implementation of batch plant inspection. This Director's Rule provides the special inspector with the procedures required by City of Seattle's Department of Planning and Development (DPD) to perform proper batch plant inspection. This Rule pertains to both continuous and periodic batch plant inspection. The Rule explains the procedures that all Reinforced Concrete and Placement inspectors must follow – from arrival at the batch plant to how the calculations will be made using the correct data sources.

Background

Batch plant inspection is required by the 2003 Seattle Building Code (SBC), Section 1704.4.2, under one of the following circumstances:

1) Concrete mixes prepared in a batch plant that is not certified by the City of Seattle;
2) All structural lightweight concrete mixes;
3) Concrete mixes with $f'_c$ greater than 6,000 psi;

4) Concrete mixes containing alternative materials addressed in Section 1704.4.1; or

5) Other unusual circumstances as determined by the building official.

Exception: Inspection during the mixing of concrete shall not be required when the proportions of ingredients are established in accordance with SBC Table 1905.2 or when a mix has been granted continuous approval by the building official.

**Rule**

A batch plant providing concrete for a City of Seattle permitted project must follow the inspection procedures outlined in this rule. This rule is divided into two sections – the first section pertains to continuous batch plant inspection, and second section is a pilot program being tested by the City pertaining to periodic batch plant inspection. Whether continuous or periodic batch plant inspection is required will be determined by DPD at a preconstruction meeting. Unless otherwise determined at the preconstruction meeting, the special inspector is to assume all inspections performed at the batch plant are for continuous inspection.

Only inspectors certified by Washington Association of Building Officials (WABO) in either Reinforced Concrete or Placement shall perform batch plant inspection. This Rule does not address all aspects of batch plant inspection. Proper training and certification by WABO must be completed by the batch plant inspector before he or she is qualified to perform batch plant inspections.

**Definitions**

Approved testing agency – An approved testing agency is an organization, approved by WABO or a nationally recognized authority offering quality control testing and inspection services.

ASTM – American Society for Testing Materials

Concrete Producer – A manufacturer of Portland Cement products, using either a centrally mixed system or truck mixed system to combine and mix the ingredients.

DPD – City of Seattle, Department of Planning and Development

EOR- Engineer of Record

NRMCA – National Ready Mixed Concrete Association – An advocacy group representing concrete producers that provides certification of a concrete producer's capabilities to produce concrete.

NRMCA certification – certificate of conformance with quality control standards set by NRMCA for concrete production facilities and trucks.

PBPI – Periodic batch plant inspection is a DPD pilot program to evaluate the feasibility of allowing some plants to move from continuous to periodic inspection while producing high quality product.

Placement Inspector – An employee of an agency who is assigned to perform field concrete testing and concrete placement inspection for non-complex structures and who is qualified in accordance with WABO Standard No. 1701, Section 7.

Quality Control Manual (QC manual) – A QC manual is a document that outlines procedures and methods to ensure proper control over the document owner's scope of work on a project. These manuals must be approved by DPD at the preconstruction meeting and include the procedures contained in this rule.

Reinforced Concrete Inspector – An employee of a approved agency who is assigned to perform sampling, testing and/or inspection functions of the agency, and who is certified to inspect reinforced concrete in accordance with WABO Standard No. 1701.

SCM – Supplementary cementitious material such as slag, fly ash, silica fume.

Special Inspector – A Special Inspector is an employee of an approved agency who has demonstrated competency to perform the inspection of a particular type of construction in accordance with WABO Standard 1701.

Tolerance – Leeway for variation from a standard.

WABO – Washington Association of Building Officials and certifying body for agencies and inspectors.

**Continuous Batch Plant Inspection**

This section outlines the procedures for special inspectors who perform the continuous batch plant inspections as required by the Seattle Building Code.

Inspection Procedure:

1. The approved testing agency is required to provide proper batch plant inspection procedures as part of their working Quality Control Manual and this manual must be approved by the engineer of record and DPD prior to placing any high strength concrete.

2. All field personnel conducting batch plant inspections shall be certified by WABO as either a Reinforced Concrete or a Placement inspector. These are minimum qualifications.

3. The Concrete Producer shall supply the mix design, stamped and approved by the City of Seattle Department of Planning and Development (DPD), to the contractor.
   3.1. If the mix design in question is considered a proprietary mix, the ingredients are still required to be provided to the special inspection agency and DPD. The mix design shall be secured, and only released to authorized inspectors who have signed any non-disclosure forms required by the producer. DPD will maintain the approved mix design copy in a secured cabinet.

4. The contractor is required to provide a copy of the original stamped approved mix design to the special inspection agency. The mix design is required to be in the special inspection agency's possession prior to placement of any concrete requiring batch plant inspection.

5. The contractor will provide the minimum notification to the special inspection agency as required by that agency prior to placement of any concrete requiring a batch plant inspection.
   5.1. No concrete requiring batch plant inspection shall be approved for placement without batch plant inspection.

6. The special inspector dispatched to provide batch plant inspection will receive a copy of the approved mix from their agency only.
   6.1. The testing agency will provide a copy of the original stamped approved mix design to the batch plant inspector prior to the required inspection.
   6.2. At no time will the special inspector be given the approved mix design by the concrete supplier.
   6.3. The mix design provided to the inspector must be stamped with both the EOR stamp and DPD stamp.
   6.4. The batch plant inspector shall return the copy of the original stamped approved mix design to the testing agency as soon as possible following the inspection to ensure the mix is readily available for the next batch plant inspection.

7. The special inspector shall verify each of the following items prior to performing mix design calculations at the batching office:
   7.1. Verify documentation of current calibration for scales, meters, and other measuring devices and current NRMCA certification of batch plant.-

7.1.1. If there is no NRMCA documentation, or if the certification has expired, the special inspector shall immediately contact the DPD structural inspector at 206.684.8475.
7.1.2. The NRMCA documentation shall also include information relating to the certification of concrete delivery vehicles.
7.1.3. At any time, the purchaser (project owner or project engineer) may request the special inspection agency compare plant attributes with the check list to verify that the NRMCA certificate provides valid evidence of production capability.

7.2. During winter months, verify that the water heaters are functioning as required, and that aggregate stockpiles are also protected from freezing.
7.2.1. Taking a temperature reading according to ASTM C1064 is sufficient to determine water heaters are functioning properly.

7.3. During summer months, verify that water coolers (if provided) are functioning properly, and that water spray systems are functioning properly.
7.3.1. Taking a temperature reading according to ASTM C1064 is sufficient to determine water coolers or water spray systems are functioning properly.

8. The special inspector is to perform all sampling and testing required by the project specifications at the intervals determined in the specifications or as requested by the engineer of record or owner's representative.

9. The special inspector is to document the results of the tests performed, including verification of the NRMCA certification and other calibration documentation. The dates listed on the documents indicating compliance must be noted in the special inspector's report.

10. The special inspector should determine the estimated number of batches that will be made (i.e. (2) 5 yard loads, or (1) 10 yard load).
10.1. This determination is necessary in preparing the maximums and minimums of the design mix.

11. The special inspector will calculate the maximums and minimums using the special inspection agency supplied mix design and the estimated load yardage.

12. Tolerance for the ingredients will be according to ASTM C94 Section 8:
12.1. Cement shall be within 1% of design.
12.1.1. If cement does not meet the 1% tolerance, it is out of tolerance and shall be rejected.
12.2. Fly ash, slag, or other SCM's shall be within 1% of the cumulative weight of the combined cement + SCM's.
12.2.1. For example, if cement is 500 lbs, and there is 100 lbs of fly ash and 50 lbs of slag, cement must be within 1% of 500 lbs and the cement + fly ash + slag also must be within 1% of 650 lbs. Cement = 495-505 lbs and concrete + fly ash + slag = 644-656 lbs.
12.3. Sand and aggregates have different tolerances based on the weighing system.
12.3.1. If the aggregates are weighed independently of each other (non-cumulative), the tolerance is 2% for each type of aggregate.
12.3.2. If the aggregates are weighed together (cumulatively), the tolerance shall be 1% for each successive weighing.
12.4. Chemical admixtures shall be within 3% of design.
12.5. Water shall not exceed 1% of design.

13. The load shall be rejected if any of the cementitious materials are under the allowable tolerance.

14. The special inspector shall indicate whether the scale system weighed cement and mineral admixtures individually or cumulatively. The special inspector shall also indicate whether the aggregates were weighed individually or cumulatively.

15. The special inspector shall witness the delivery truck back-spinning its drum (discharging) until all water and other deleterious material is evacuated from the drum.

16. The special inspector shall monitor the digital scales during batching, recording all numbers.
    16.1. The special inspector is not to calculate the tolerances using the printed compliance sheet - only the digital scale readings shall be used.

17. If any of the ingredients exceed the allowable tolerance, then the concrete should not be placed.

18. The special inspector shall sign the delivery ticket or the compliance sheet indicating that the load is within all tolerance.

19. The batch-person is required to hold the recently batched concrete truck while the special inspector prepares to take any tests of the freshly batched concrete as required per section 8 of this rule.

20. If the delivery truck uses any wash water to clean the hopper or load wheels, the special inspector must be present to document the amount of water used, and add that to the water used to batch the mix. If the wash water results in the water tolerance to be out of specifications, then the truck must be rejected.
    20.1. The truck will not be allowed to clean the hopper or load wheels if there is no metered water source using a dial gauge to indicate amount of water used.

<u>Determination of Acceptability and Reporting:</u>

21. Water is allowed to be below the low tolerance and still be considered acceptable for delivery. If the water is above the high tolerance, it shall be rejected.

22. If all the ingredients are between the high and low tolerance, the load is considered acceptable for delivery to the jobsite, the special inspector shall sign the compliance sheet and indicate to the driver or batch-person that the load is acceptable for delivery to the project site.

23. If any ingredient is above the high tolerance or below the low tolerance (excluding exceptions noted in section 12 above), it is considered unacceptable for delivery to the jobsite. Do not sign the compliance sheet. Indicate to the batch-person or driver the reason for the rejection, note the ticket number and truck number that is being rejected, and the reason. Contact the site special inspector, provide the rejected ticket and truck numbers, and advise the site inspector of the estimated delay in delivery.

24. The minimum information to be documented is:
    24.1 Project name, address and permit number.
    24.2 Concrete producer, batch plant, and mix design number.
    24.3 Date, batch plant inspector, and weather conditions.

24.4 Mix design (unless mix is a proprietary mix), target per load, high and low tolerance, actual load weights and indication ingredients are within tolerance.
24.5 Truck number, time batched with any tests made on the freshly batched concrete and the results.
24.6 Batch plant inspector's signature indicating load ingredients are within design specifications.

**Periodic Batch Plant Inspection (PBPI) – DPD Pilot Program**

The primary goal of the periodic batch plant inspection is to determine the viability of decreasing the required number of batch plant inspections for mixes with F'c greater than 6,000 psi. Due to the unusual deviation from code, DPD has instituted the additional requirements contained in this rule. These requirements assure DPD that delivered concrete products will maintain the same level of excellence that the City of Seattle has achieved with continuous batch plant inspections.

PBPI design mix submittal procedure

1. If a design mix is to be presented to DPD for inclusion into the PBPI program, the following criteria must be met:
   1.1. The mix must be one that has been used on 5 or more projects.
   1.2. There must be statistical data (15 or more tests) on the mix in the DPD concrete database
   1.3. The supplier must also have statistical data on the mix with 30 or more tests
   1.4. The mix may only be produced from plants certified by NRMCA
   1.5. The mix is for F'c of 9,000 psi or less (at any age)

2. The submittal must contain, as a minimum, the following information:
   2.1. Mix ID to be used throughout project life.
   2.2. Mix ingredients, source, type, and amount.
   2.3. Specified f'c, slump, air (if any) and water /cement ratio.
   2.4. Supplier name and plants that will provide mix to project.
   2.5. Structural members mix is to be used on (columns, core walls, beams, etc.)
   2.6. List of prior projects the mix was used on.
   2.7. Supplier statistical data with 30 or more tests
   2.8. Project name.

Any other data that the supplier feels is relevant may be included with the submittal.

3. The mix and all pertinent data must be submitted to DPD a minimum of 5 days prior to the scheduled High Strength Preconstruction meeting. The mix is required to have been approved and stamped by the engineer of record prior to the submission to DPD. If the mix is not submitted prior to the meeting, it will not be approved for PBPI until the information is reviewed by DPD.

4. The mix will either be accepted as submitted and approved for PBPI, or may be disapproved by DPD. The contractor, supplier, engineer of record and the testing agency will be informed of DPD's determination whether continuous or periodic batch plant inspection will be required.
   4.1. The engineer of record or project owner has the authority to require continuous batch plant inspection. Regardless of DPD's acceptance of the mix in question to be periodically inspected at the batch plant, if the engineer of record or project owner request continuous batch plant inspection, the mix will be disapproved for periodic batch plant inspection for the project and continuous batch plant inspection will be required.

5. Inspection procedure:

The general contractor is required to provide a copy of the original stamped approved mix design to the special inspection agency. The mix design is required to be in the special inspection agency's possession prior to mixing of any concrete requiring batch plant inspection.

5.1. If the mix design in question is considered a proprietary mix, the ingredients are still required to be provided to the special inspection agency. The mix design shall be secured, and only released to authorized inspectors who have signed any non-disclosure forms required by the producer. DPD will maintain the approved mix design copy in a secured cabinet.

6. During the preconstruction meeting, if the mix has been approved by both DPD and the engineer of record or owner's representative for periodic batch plant inspection, the interval between the periodic batch plant inspections will be determined by DPD. This interval may not be exceeded for any reason.
   6.1. The factors that determine the required interval of inspection are based on the following criteria:
      6.1.1. Historical data indicating past performance of mix.
      6.1.2. F'c requirements.
      6.1.3. Number of yards estimated for each pour interval (day, week, or month).
      6.1.4. Whether the mix contains exotic or unusual combinations of admixtures or supplementary cementitious materials.

7. The testing agency will ensure that the DPD required interval for periodic inspection is maintained.
   7.1. Whatever the inspection interval, it is the testing agency's responsibility to be sure that the interval is never exceeded and that the minimum testing is performed.

8. In addition to the normal duties performed by the special inspector, the inspector dispatched to provide batch plant inspection will receive a copy of the approved mix design from their agency only.
   8.1. A copy of the original stamped approved mix design must be provided to the batch plant inspector prior to the required inspection.
   8.2. At no time will the special inspector be given the approved mix design by the concrete supplier.
   8.3. The mix design provided to the inspector must be stamped with both the EOR stamp and a DPD stamp.
   8.4. The batch plant inspector shall return the copy of the original stamped approved mix design to the testing agency as soon as possible following the inspection to ensure the mix is readily available for the next batch plant inspection.

<u>Non-inspection requirements:</u>

9. Supplier:
   9.1. The supplier is required to submit a Quality Control Manual indicating that the batching, delivery, and testing protocol addresses all issues raised during the preconstruction meeting and this manual must be approved by the engineer of record and DPD prior to placing any high strength concrete. The supplier must follow the procedures contained in this rule prior to and during the production and delivery of the mix:
      9.1.1. Batch operator will indicate on the delivery ticket that he/she verified the complete reversal of the drum, indicating that all deleterious material and excess water was evacuated from the drum.

9.1.2. Trucks will not be allowed to use any wash water after being batched. The driver shall indicate on the delivery ticket that no wash water was used.
9.1.3. Trucks delivering the high strength concrete will be equipped with drum revolution counters, and the driver, before leaving the batch plant, shall record the revolution of the drum after being batched on the delivery ticket.

10. Site Special Inspector:

Note: SBC Section 1704.4 requires a special inspector to be on site prior to and during all concrete placements when the concrete strength exceeds 2500 psi.

10.1. The site special inspector must follow this procedure during placing and testing of the mix:
10.1.1. The special inspector will verify that the ticket indicates the drum was evacuated as required, that the driver has indicated the drum revolution counter reading at time batching was complete and that there was no wash water used after being batched.
10.1.1.1. No mix will be approved for placement without indication that the drum was reversed, the drum revolution counter reading was documented and that the driver used no wash water.
10.1.2. The inspector will write the drum revolution counter reading on the delivery ticket at the time the mix arrives on site.
10.1.3. If water or admixture is to be added to the mix, the special inspector will document the following information on the ticket:
10.1.3.1. Amount and type of admixture added,
10.1.3.2. Approximate quantity of concrete in truck when additional admixture was added,
10.1.3.3. And number of drum revolutions at mixing speed after the addition of water or admixture.
10.1.4. Acceptance testing shall be performed at the end of the chute prior to placing in the conveying vehicle used to transport the mix to the forms.
10.1.5. Strength testing shall be taken from the end of the conveyance vehicle used to transport the mix to the forms.

11. Contractor:
11.1. The contractor is required to submit a QC manual that addresses any issues raised during the preconstruction meeting and this manual must be approved by the engineer of record and DPD prior to placing any high strength concrete.
11.2. The contractor is to take the following measures during placing of the mix:
11.2.1. The contractor must ready to place the first load of concrete into the structural member prior to the concrete's arrival.
11.2.2. The contactor will have the standby vibrator ready and easily accessible.
11.2.3. The contactor will have adequate staff available to ensure the pour is not delayed unnecessarily and is completed from start to finish in the shortest amount of time possible.
11.2.4. The contractor will provide the special inspector with any assistance necessary to perform their inspection.
11.2.5. The contractor must verify that the lime bath cure tank, supplied by the testing agency, has a reliable power source and that it is protected from unauthorized personnel or excessive foot and vehicular traffic.
11.2.5.1. Placing a light bulb in line with the power source is a quick and easy way to determine the tank is receiving power. This only helps indicate the tank is receiving power and does not signify that the tank is functioning properly.

12. Testing Agency:
    12.1. The testing agency is required to adhere to the schedule of periodic batch plant inspection determined by the engineer of record and DPD during the preconstruction meeting. A QC manual indicating that the testing protocol addresses the issues raised during the preconstruction meeting is required to be submitted and approved by the engineer of record and DPD prior to the first high strength concrete placement.
    12.2. The testing agency is to take the following measures during pick up, transporting, curing and testing of the mix to minimize the amount of time the samples are unprotected:
        12.2.1. The testing agency will supply a lime bath cure tank on site prior to the delivery of any concrete for the project.
        12.2.2. The testing agency will record the maximum and minimum temperature at the time the samples are picked up.
        12.2.3. The samples picked up will either be:
            12.2.3.1. The only samples picked up and delivered to the laboratory, or
            12.2.3.2. The last pick up of the day prior to delivery to the laboratory.
        12.2.4. The pick-up driver must record the maximum and minimum thermometer readings at the time of pick up.
        12.2.5. The lab must provide DPD with the break results as soon as they are available. The lab must include the maximum and minimum temperatures recorded by the pick-up driver in their report to DPD.

13. Determine Acceptability and Reporting:
    13.1. In addition to the continuous batch plant inspection acceptability and reporting procedures indicated sections 22-24 of continuous batch plant inspection procedure, the following additional items are required to be completed:
        13.1.1. When a batch plant inspection is performed, the testing agency is required to correctly fill out the DPD provided "Periodic Batch Plant Inspection Checklist". This document is to be received by DPD within three business days of the concrete placement.
        13.1.2. If there was no batch plant inspection, the testing agency is required to correctly fill out the DPD provided "Periodic Batch Plant Field Inspection Checklist". This document is to be received by DPD within three business days of the concrete placement.